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Versal ACAP processing for ATLAS-TileCal signal reconstruction

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Particle detectors at accelerators generate large amount of data, requiring analysis to derive insights. Collisions lead to signal pile up, where multiple particles produce signals in the same detector sensors, complicating individual signal identification. This contribution describes the implementation of a deep learning algorithm on a Versal ACAP device for improved processing via parallelization and concurrency. Connected to a host computer via PCIe, this system aims for enhanced speed and energy efficiency over CPUs and GPUs. In the contribution, we will describe in detail the data processing and the hardware, firmware and software components of the signal reconstruction system for the ATLAS-Tile Calorimeter which will be running in real time in the HL-LHC era. The contribution presents the implementation of the deep learning algorithm on Versal ACAP device, as well as the system for transferring data in an efficient way. In addition, the system integration tests and results from the tests with beam performed at CERN will be presented.

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